REMARKS

An RCE was filed in this application on January 17, 2008, with a submission under 37 C.F.R. § 1.114. In the submission claim 1 was amended to include the limitations (previously recited in claims 3 and 5) relating to the amount of vinyl ethylene carbonate and of vinylene carbonate (and/or derivatives thereof) in the electrolyte of the nonaqueous electrolyte secondary battery of the invention. The claims remaining in the application as a result of the amendments made in the submission are claims 1 and 17.

In the present Action the Office has rejected claims 1 and 17 under 35 U.S.C. § 103(a) as being obvious over the Hatazaki and Kameda references that have been cited in previous Actions in this application. The statements of the rejections in the present action are identical to the statements of the rejections that were made in the Final Action dated July 17, 2007.

A characteristic feature of the nonaqueous electrolyte secondary battery of the present invention is that in the nonaqueous electrolyte, sulfolane is contained in an amount of 20 - 45% by volume based on the total volume of the solvent. In Hatazaki, sulfolane is contained in a maximum amount of 0.1 to 10 parts by weight per 100 parts by weight of the nonaqueous electrolyte. In the response to the Final Action, applicants provided calculations to show that 0.1 to 10 parts by weight of

sulfolane per 100 parts by weight of the electrolyte of Hatazaki is much less than 20 - 45% of sulfolane per total volume solvent as claimed in the present application. Applicants also argued that Hatazaki teaches away from increasing the amount of sulfolane above 10 parts by weight because Hatazaki describes that such an increase would result in deterioration of discharge characteristics.

The Office did not accept the calculations made in the response to the Final Action and took the position that it is unclear how applicant concludes that 0.1 to 10 parts by weight of sulfolane corresponds closely to an amount of 0.1-10% by volume based on the volume of the solvent "because parts by weight per parts by weight of the electrolyte (salt and solvent) is not equivalent to a volume percent based on the volume of solvent (only part of the electrolyte)." In the submission filed with the RCE the applicants attempted to further explain that the calculations properly convert parts by weight of sulfolane per parts by weight of the electrolyte to volume percent of sulfolane based on the volume of solvent in the electrolyte.

The Office also did not accept the argument made in the response to the Final Action that Hatazaki teaches away from increasing the amount of sulfolane above 10 parts by weight. In the submission filed with the RCE applicants explained that a person of ordinary skill in the art, upon reading Hatazaki and,

specifically, upon reading the description in paragraph [0049] of Hatazaki that "if the amount thereof (SL) is more than 10 parts by weight, the coating film formed on the electrode becomes too thick, thereby deteriorating the discharge characteristics," would be discouraged from increasing the amount of sulfolane.

In the present Action the Office has again taken the position that applicants' calculations are flawed. The Office has also rejected the argument that Hatazaki teaches away from increasing the amount of sulfolane. (See the "Response to Arguments" on pages 5-8 of the Action).

Although applicants do not understand the Office's position that the calculations relating to the amount of sulfolane in the electrolyte of Hatazaki are flawed since the Office has not provided reasoning explaining where or how the calculations are flawed, further calculations and data and a further explanation of the calculations are provided below.

CONVERTING SULFOLANE CONTENT FROM % BY WEIGHT (ELECTROLYTE) TO % BY VOLUME (SOLVENT)

Normally, when a solute is dissolved in a solvent, the volume of the solute is decreased. (This fact is well-known in basic chemistry). Therefore, two assumptions have been used in present calculations of the volume % of the sulfolane contained in the electrolytes of the batteries of Hatazaki. Assumption 1 ignores

the solute volume. Assumption 2 assumes that solute volume does not change when dissolved. The actual volume of the solute in the electrolyte of Hatazaki is somewhere between that of Assumption 1 and that of Assumption 2 (but is very close to that of Assumption 1).

Regardless of whether Assumption 1 or Assumption 2 is used, the amount of sulfolane in the electrolyte compositions described in Hatasaki corresponds to a maximum of about 10.1 % by volume, and is materially different from the range recited in the claims of the present invention (i.e., 20 % by volume ~).

The amount of sulfolane in terms of volume % in Battery 31 in Example 3 of Hatazaki is calculated below and the data are shown in the attached table. Additional tables are attached showing the volume % per solvent of sulfolane in the electrolyte of Batteries 36, 38, 40, 42 and 44 of Hatazaki and showing the data used in the calculations.

- Assumption 1 (assuming that the solute volume is zero)

The composition of the electrolyte used in Example 3 (study of SL addition in Battery 31) is 1 mol/$LiPF_6$ EC/EMC (1/3) (see paragraph [0073] of Hatasaki). When it is assumed that the volume of $LiPF_6$ can be ignored, the specific gravity of this electrolyte is calculated as 1.237 from the molecular weight of $LiPF_6$ (151.9), the

specific gravity of EC (1.322) and the specific gravity of EMC (1.007).

Regarding the calculation of the specific gravity of the electrolyte, when 1 mol of $LiPF_6$ (151.9 g) is dissolved in a mixed solvent of 250 ml of EC (330 g) and 750 ml of EMC (755 g), the weight of the electrolyte when 1 ℓ of the mixed solvent (EC/EMC) is used is 1237 g.

When 0.1 ~ 10 % weight of SL is added to 1 ℓ (1237 g) of the electrolyte, weight of the added SL is 1.237 g ~ 123.7 g. The volume of the added SL is calculated from the specific gravity of SL, i.e., 1.264, as (1.237 g ~ 123.7 g)/1.264 = 0.979 ~ 97.9 ml. Then % by volume of SL per solvent (including SL) can be calculated as 0.979/(1000+0.979) ~ 97.9/(1000+97.9) = 0.0978 %by volume ~ 8.92 % by volume.

- Assumption 2: (Assuming that the volume of the solute does not change after the solute is dissolved in the electrolyte (i.e., the volume of the solute is the same as when it is solid))

The composition of the electrolyte is 1 mol/$LiPF_6$ EC/EMC (1/3) as described above in Assumption 1. When it is assumed that the volume of $LiPF_6$ in the electrolyte does not change, i.e., it is the same as when it is solid, the specific gravity of this electrolyte is calculated as 1.177 from the molecular weight of $LiPF_6$ (151.9), the specific gravity of $LiPF_6$ (2.72), the specific gravity of EC (1.322) and the specific gravity of EMC (1.007).

Regarding the calculation of the specific gravity, when 1 mol of $LiPF_6$ (151.9 g) is dissolved to prepare 1 ℓ of the electrolyte, the volume of $LiPF_6$ is 55.8 ml. Then, the remaining components of the electrolyte, i.e., EC and EMC, are mixed at the ratio of 1:3 to prepare 1 ℓ of the electrolyte. That is, (1000-55.8) = 944.2 ml of a mixture of EC and EMC are prepared by mixing 236 ml (944.2 ml x 1/4) of EC and 708.1 ml (944.2 ml x 3/4) of EMC. The weight of 1 ℓ of the prepared electrolyte is 1177 g (151.9 g ($LiPF_6$) + 312 g (EC) + 713.1 g (EMC)).

When 0.1 ~ 10 % weight of SL is added to 1 ℓ (1177 g) of the electrolyte, the weight of the added SL is 1.177 g ~ 117.7 g. The volume of the added SL is calculated from the specific gravity of SL, i.e., 1.264, as (1.177 g ~ 117.7 g)/1.264 = 0.931 ~ 93.1 ml. Then, % by volume per solvent including SL can be calculated as 0.931/(944.2+0.931) ~ 93.1/(944.2+93.1) = 0.0985 % by volume ~ 8.98 % by volume.

The attached tables show that the volume % of sulfolane per the total amount of solvent of the electrolyte of the other batteries (as identified above) of Hatazaki is a maximum of about 10.1 volume %.

The above calculations properly show that the amount of sulfolane disclosed as being useful as an additive in the electrolyte of Hatazaki and used in the batteries of the examples

does not exceed about 10 volume %, based on the volume of the solvents of the electrolyte (even when the volume of the solute is assumed to be unchanged upon dissolution), and is materially less that the minimum amount of 20 % by volume required by applicants' claims.

Regarding the Office's arguments relating to the issue of whether Hatazaki teaches away from increasing the amount of sulfolane, the argument that the teachings in paragraph [0049] of Hatazaki lead away from increasing the amount of sulfolane as in the present invention only if the same deteriorating discharge characteristics do not result in the present invention is not correct. The issue is how one of ordinary skill in the art would understand the teachings of paragraph [0049] of Hatazaki - not what applicants have discovered.

With respect to this issue, applicants again respectfully submit that a person of ordinary skill in the art, upon reading Hatazaki and, specifically, upon reading the description in paragraph [0049] of Hatazaki that "if the amount thereof (SL) is more than 10 parts by weight, the coating film formed on the electrode becomes too thick, thereby deteriorating the discharge characteristics," would be discouraged from following the path set out in Hatazaki, i.e., would be discouraged from increasing the amount of sulfolane in a similar battery.

As applicants have previously noted, the Federal Circuit has explained that "[a] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Kahn*, 441 F.3d at 990 (quoting *In re Gurley*, 27 F.3d 551, 553 [31 USPQ2d 1130] (Fed. Cir. 1994)) (internal quotation marks omitted) (emphasis applicants'). The position of the Office is not consistent with the position of the holdings of the Federal Circuit.

Moreover, the present invention was made on the basis of a discovery by the applicants that a non-aqueous electrolyte secondary battery which includes an electrolyte containing sulfolane in a range of 20- 45 % by volume, on the basis of the total volume of solvent, and a negative electrode which includes a carbon material, has excellent charge and discharge characteristics when an additive of vinylene carbonate (VC) and vinyl ethylene carbonate (VEC) is added to the electrolyte in an amount of 0.1 ~ 5 % by weight. (Refer to the data in Table 1 in the specification). Such results are not obvious from Hatazaki.

For the above reasons, Hatazaki is insufficient to support a case of prima facie obviousness of the nonaqueous electrolyte secondary battery recited in claims 1 and 17 of the present

application within the meaning of 35 U.S.C. § 103(a). (The propriety of the rejection of claim 17 depends on the propriety of the rejection of claim 1). Removal of the 35 U.S.C. § 103(a) grounds of rejection are in order and are respectfully solicited.

The foregoing is believed to be a complete and proper response to the Office Action dated April 7, 2008.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension and any additional fees may be charged to Deposit Account No. 111833.

Respectfully submitted,
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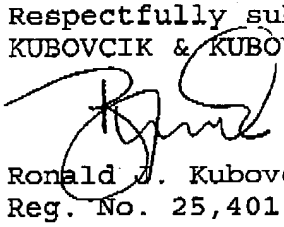

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Attachment: Calculation tables (Batteries 31, 36, 38, 40, 42 and 44 of Hatazaki) (12 pages)

<Battery 31 in the Hatazaki> Electrolyte Composition: 1M $LiPF_6$ EC/EMC (1/3)

- Assumption 1: SL content 0.0978 ~ 8.92 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
EC	1.322	250	330.5	24.98	250	330.5	22.77
EMC	1.007	750	755.3	74.93	750	755.3	68.31
Total (not including SL)	-	1000	1237.7	-	1000	1237.7	-
SL 0.1%	1.264	0.979	1.238	0.0978	-	-	-
SL 10%	1.264	-	-	-	97.9	123.8	8.92
Total	-	1000.979		100	1097.9		100

- Assumption 2: SL content 0.0985 ~ 8.98 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
EC	1.322	236.0	312.0	24.98	236.0	312.0	22.76
EMC	1.007	708.1	713.1	74.93	708.1	713.1	68.27
Total (not including SL)	-	1000	1177.0	-	1000	1177.0	-
SL 0.1%	1.264	0.931	1.177	0.0985	-	-	-
SL 10%	1.264	-	-	-	93.1	117.7	8.98
Total	-	1000.931		100	1093.1		100

<Battery 36 in Hatazaki> Electrolyte Composition: 1M $LiPF_6$ EC/GBL (40/60)

- Assumption 1: SL content 0.107 ~ 9.69 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
EC	1.322	400	528.8	39.96	400	528.8	36.12
GBL	1.1254	600	675.2	59.93	600	675.2	54.19
Total (not including SL)	-	1000	1355.9	-	1000	1355.9	-
SL 0.1%	1.264	1.073	1.356	0.107	-	-	-
SL 10%	1.264	-	-	-	107.3	135.6	9.69
Total	-	1001.073		100	1107.3		100

- Assumption 2: SL content 0.108 ~ 9.75 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
EC	1.322	377.7	499.3	39.96	377.7	499.3	36.10
GBL	1.1254	566.5	637.5	59.93	566.5	637.5	54.15
Total (not including SL)	-	1000	1288.7	-	1000	1288.7	-
SL 0.1%	1.264	1.02	1.289	0.108	-	-	-
SL 10%	1.264	-	-	-	102.0	128.9	9.75
Total	-	1001.02		100	1102.0		100

<Battery 38 in Hatazaki> Electrolyte Composition: 1M $LiPF_6$ EC/PC/GBL (35/55/10)

- Assumption 1: SL content 0.110 ~ 9.92 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
EC	1.322	350	462.7	34.96	350	462.7	31.53
PC	1.21	550	665.5	54.94	550	665.5	49.54
GBL	1.1254	100	112.5	9.99	100	112.5	9.01
Total (not including SL)	-	1000	1392.6	-	1000	1392.6	-
SL 0.1%	1.264	1.102	1.392	0.110	-	-	-
SL 10%	1.264	-	-	-	110.2	139.2	9.92
Total	-	1001.102		100	1110.2		100

- Assumption 2: SL content 0.111 ~ 9.98 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
EC	1.322	330.5	436.9	34.96	330.5	436.9	31.51
PC	1.21	519.3	628.3	54.94	519.3	628.3	49.51
GBL	1.1254	94.4	106.3	9.99	94.4	106.3	9.00
Total (not including SL)	-	1000	1323.4	-	1000	1323.4	-
SL 0.1%	1.264	1.047	1.323	0.111	-	-	-
SL 10%	1.264	-	-	-	104.7	132.3	9.98
Total	-	1001.047		100	1104.7		100

<Battery 40 in Hatazaki> Electrolyte Composition: 1M $LiPF_6$ EC/PC (50/50)

- Assumption 1: SL content 0.112 ~ 10.09 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
EC	1.322	500	661	49.94	500	661	44.93
PC	1.21	500	605	49.94	500	605	44.93
Total (not including SL)	-	1000	1417.9	-	1000	1417.9	-
SL 0.1%	1.264	1.122	1.418	0.112	-	-	-
SL 10%	1.264	-	-	-	112.2	141.8	10.09
Total	-	1001.122		100	1112.2		100

- Assumption 2: SL content 0.113 ~ 10.14 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
EC	1.322	472.1	624.1	49.94	472.1	624.1	44.93
PC	1.21	472.1	571.2	49.94	472.1	571.2	44.93
Total (not including SL)	-	1000	1347.2	-	1000	1347.2	-
SL 0.1%	1.264	1.066	1.347	0.113	-	-	-
SL 10%	1.264	-	-	-	106.6	134.7	10.14
Total	-	1001.066		100	1106.6		100

<Battery 42 in Hatazaki> Electrolyte Composition: 1M $LiPF_6$ GBL/VC (95/5)

- Assumption 1: SL content 0.102 ~ 9.25 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
GBL	1.1254	950	1069.1	94.90	950	1069.1	86.21
VC	1.355	50	67.8	4.99	50	67.8	4.54
Total (not including SL)	-	1000	1288.8	-	1000	1288.8	-
SL 0.1%	1.264	1.020	1.289	0.102	-	-	-
SL 10%	1.264	-	-	-	102.0	128.9	9.25
Total	-			100			100

- Assumption 2: SL content 0.103 ~ 9.31 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
GBL	1.1254	896.9	1009.4	94.90	896.9	1009.4	86.15
VC	1.355	47.2	64.0	4.99	47.2	64.0	4.53
Total (not including SL)	-	1000	1225.3	-	1000	1225.3	-
SL 0.1%	1.264	0.969	1.225	0.103	-	-	-
SL 10%	1.264	-	-	-	96.9	122.5	9.31
Total	-	1000.969		100	1096.9		100

<Battery 44 in Hatazaki> Electrolyte Composition: 1M $LiPF_6$ GBL/VC/PS (94/2/4)

- Assumption 1: SL content 0.102 ~ 9.28 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	0	151.9	-	0	151.9	-
GBL	1.1254	940	1057.9	93.90	940	1057.9	85.28
VC	1.355	20	27.1	2.00	20	27.1	1.81
PS	1.393	40	55.7	4.00	40	55.7	3.63
Total (not including SL)	-	1000	1292.6	-	1000	1292.6	-
SL 0.1%	1.264	1.023	1.293	0.102	-	-	-
SL 10%	1.264	-	-	-	102.3	129.3	9.28
Total	-	1001.023		100	1102.3		100

- Assumption 2: SL content 0.103 ~ 9.34 % by volume

	Specific Gravity	SL 0.1%			SL 10%		
		Volume (ml)	Weight (g)	% by Volume (%)	Volume (ml)	Weight (g)	% by Volume (%)
$LiPF_6$	2.72	55.8	151.9	-	55.8	151.9	-
GBL	1.1254	887.5	998.8	93.90	887.5	998.8	85.22
VC	1.355	18.9	25.6	2.00	18.9	25.6	1.81
PS	1.393	37.8	52.6	4.00	37.8	52.6	3.63
Total (not including SL)	-	1000	1228.9	-	1000	1228.9	-
SL 0.1%	1.264	0.972	1.229	0.103	-	-	-
SL 10%	1.264	-	-	-	9.72	122.9	9.34
Total	-	1000.972		100	1009.72		100